Before the
Department of Commerce
National Telecommunications and Information Administration
and
First Responder Network Authority
Washington, D.C. 20230

In the Matter of	)	
	)	
Development of the Nationwide	)	Docket No: 120928505-2505-01
Interoperable Public Safety	)	
Broadband Network	)	

COMMENTS OF SPRINT NEXTEL CORPORATION

I. INTRODUCTION AND SUMMARY

Sprint Nextel Corporation ("Sprint") respectfully submits these comments in response to the October 4, 2012 Notice of Inquiry ("NOI") issued by the National Telecommunications and Information Administration ("NTIA") on behalf of the First Responder Network Authority ("FirstNet"). In soliciting comment on the conceptual network architecture presentation made at the September 25th, 2012 FirstNet Board of Directors meeting, as well as on other network design and business plan considerations (including the general concept for public safety applications development outlined by Chairman Sam Ginn), FirstNet has taken an important step in engaging with relevant public and commercial sector stakeholders on how best to realize the key objectives set forth in the legislation establishing FirstNet.

Sprint appreciates the opportunity to comment on FirstNet's Notice of Inquiry. As a commercial partner of public safety for over two decades, Sprint believes that public-private partnerships like those envisioned in the conceptual network architecture presentation will facilitate the quickest and most cost-effective approach to building out the Nationwide Public Safety Broadband Network ("NPSBN"). Realization of the full range of benefits of public-

private partnerships, however, depends on a number of factors. Competition represents perhaps the most crucial determinant of the success of the type of long-term public-private partnership envisioned by FirstNet to provide a critical public good. As a report by the Government Accountability Office describes, for too long public safety users have been held hostage to sole-sourced equipment, devices, and services.[1]

The conceptual network architecture presentation emphasizes reliance on a diversity of commercial partners. In successful public-private partnerships, the public and private partners have mutual interests and share a long-term vision and commitment. Competition in the procurement and deployment process would allow FirstNet (and its public safety constituents) to seek partners that can best meet the service needs and coverage requirements within particular geographic areas, based on FirstNet's consultations with state, regional, tribal, and local jurisdictions.

As the FirstNet Board of Directors no doubt knows, the process for developing the NPSBN will be complex, extensive in geographic scope, and highly dependent upon the successful engagement of relevant public and commercial stakeholders. To address these challenges, a number of important considerations should inform FirstNet's implementation of the FirstNet Nationwide Network (FNN) Concept contained in the conceptual network architecture presentation or any alternative implementation approach FirstNet ultimately selects. These considerations frame Sprint's subsequent comments on FirstNet's deployment approach.

Of particular importance, state, regional, tribal and local needs should drive any network deployment approach FirstNet ultimately selects. The FNN Concept appropriately identifies consultation and planning as primary responsibilities of FirstNet, describing FirstNet's role in

[1] Government Accountability Office, "Emergency Communications: Various Challenges Likely to Slow Implementation of a Public Safety Broadband Network," (February 2012).

identifying the needs of first responders, working with state, regional, tribal, and local public safety jurisdictions to define their geographic coverage requirements, and providing a nationwide network plan that reflects these needs and requirements. Sprint and other parties have emphasized the importance of early and extensive consultation and collaboration with state and local stakeholders in comments on the State and Local Implementation Grant Program.[2] Through such consultations, FirstNet can also gather important information about the ways in which state, regional, tribal, and local jurisdictions may want to approach leveraging public infrastructure, collaboration with other entities (public and commercial), geographic roaming requirements, device requirements, and other service needs. FirstNet's ultimate decision-making – including design and deployment of the network – must reflect and meet the broadband and interoperability needs of public safety users in varying locations, situations, and jurisdictions.

From these consultations with states and local jurisdictions, FirstNet should focus on identifying areas of common concern. It should align needs, emphasize collaboration (both intrastate and interstate) and develop a sensible regional model that best reflects the deployment schedule and core commonalities that unify particular geographic areas. A coherent regional model would avoid duplication of effort, create administrative efficiencies for states and FirstNet, promote interoperability, and move state and local jurisdictions in the direction of closer collaboration to achieve the benefits of scale that have typically eluded public safety communications infrastructure and user devices.

Lastly, FirstNet's network architecture and deployment approach must recognize that service needs and geographic requirements will vary across different regions, states, tribal areas,

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[2] Comments of Sprint Nextel Corporation, *Development of State and Local Implementation Grant Program for the Nationwide Public Safety Broadband Network*, Docket No: 120509050-1050-01 (June 15, 2012); James A. Barnett, "What Should FirstNet Do First? State Integration into the National Public Safety Network," Potomac Institute for Policy Studies, at 9 (Sept. 24, 2012).

and localities. To best reflect this variability, FirstNet should embrace a deployment framework that emphasizes flexibility, leveraging the most appropriate commercial and public sector resources for a particular region or geographic area.

For example, in constructing a completely new network architecture through its Network Vision initiative, Sprint is using a flexible deployment approach, relying on supplier competition and diversity, procurement policies that can respond dynamically to delays or new events, and a software-defined multi-modal network architecture enabling Sprint to readily adapt to future network needs. Sprint's Network Vision provides a platform through which Sprint can offer FirstNet and the NPSBN jurisdictions a broad range of partnership opportunities – from full network hosting to passive colocation.

Ultimately, the extent of collaboration between FirstNet and public and commercial entities will depend on the resources, needs, and assets of regional areas. A network architecture and deployment approach based on flexibility will best respond to this variability, accelerating deployment and containing costs. Commercial platforms that offer flexibility (rather than a one-size-fits-all solution) can be tailored to the needs of those areas, reflecting the FNN Concept's commitment to flexibility and as a consequence containing costs and speeding deployment.

II. WITH THE PRECEDING CONSIDERATIONS IN MIND, THE FNN CONCEPT OFFERS A VALUABLE BEGINNING.

A. The FNN Concept Is a Promising Start.

Emphasizing flexibility, cost-effectiveness, and a timely deployment, the FNN concept offers a promising foundation on which to build a network architecture and network deployment approach. Consultations with states and localities, as well as potential commercial partners, will

help refine much of the remaining work concerning network architecture and network deployment. The FNN concept appears to anticipate this, and its commitment to flexibility should facilitate such refinements from consultative work.

Having said that, FirstNet should work with all stakeholders to better define a number of key aspects of the proposed network architecture and deployment model. For instance, what will be the ultimate form of the partnership between FirstNet and commercial carriers? Specifically, in leveraging commercial infrastructure and assets, does FirstNet have a vision for comprehensive network hosting in particular regions? Does it envision a range of partnership models, ranging from comprehensive turnkey hosting and operation by a commercial entity, to passive colocation of network equipment such as antennas at shared facilities?

The FNN Concept includes a number of preliminary diagrams depicting potential network architecture and its interrelation with a terrestrial mobile network. In order to develop the most appropriate network architecture, a better definition of the Evolved Packet Core's ("EPC's") functionalities at various locations in the network diagram would help inform commercial partners about the ways in which FirstNet envisions integration of commercial network assets within the NPSBN network architecture.[3]

Perhaps dovetailing with greater definition of the functionality of the EPC in the network architecture is the need for a greater understanding of the operational, administrative, and implementation role FirstNet foresees undertaking. At a very general level, it is clear that FirstNet will provide a unified and overarching framework to connect public and commercial networks. At the operational level, does FirstNet envision taking an active role in the development of Service Level Agreements and Interconnection Agreements? Will FirstNet

[3] For example, certain functionalities of the EPC might be hosted in consolidated NPSBN EPC locations while other functionalities might be hosted in the locations of commercial partners.

develop Master Services Agreements and/or model contracts (or best practices) that specify the ways in which existing commercial and public network connect both with each other and with the NPSBN (itself ostensibly a composite of commercial and public network assets)? Would FirstNet delegate these administrative and operational duties to others, such as regional managers serving within FirstNet or outside contractors?

Lastly, while the FNN Concept (and live presentation) acknowledged the "range of devices" different public safety entities would need supported, it would be informative for FirstNet to provide a device development roadmap. With support for Band 14, integration of existing LMR frequencies, a range of LTE bands of varying commercial carriers, and likely 3G bands of commercial carriers for roaming, the chipsets for public safety devices will be complex and may require choices. Though FirstNet has emphasized the importance of helping public safety users realize the economies of scale of commercial carriers, it remains unclear what role FirstNet anticipates playing in helping to achieve that. Notably, the Spectrum Act explicitly directs FirstNet to "promote competition in the equipment market, including devices for public safety communications, by requiring that equipment for use on the network be (i) built to open, non-proprietary, commercially available standards; (ii) capable of being used by any public safety entity and by multiple vendors across all public safety broadband networks operating in the 700 MHz band; and (iii) backward-compatible with existing commercial networks to the extent that such capabilities are necessary and technically and economically reasonable."[4] How does FirstNet approach device development in light of this statutory directive?

[4] Middle Class Tax Relief and Job Creation Act of 2012, Pub. L. No. 112-96, § 6206(b)(2)(B) (2012).

B. The FNN Concept's Layered Network Model Can Dovetail with the Development of a Nationwide Network Plan through Extensive Consultation with State, Regional, Tribal, and Local Jurisdictions.

Highly modular in nature, the FNN Concept's deployment framework should prove adaptable to the wide range of jurisdictions in which it must be implemented. Marked by significant geographic differences (including in topography, population density, and climate), the Unites States presents a complex mosaic upon which FirstNet must establish the NPSBN. These geographic differences present markedly different service needs and coverage requirements. Moreover, this mosaic is further complicated by the political and economic characteristics that distinguish not only adjacent regions, but frequently also adjacent *jurisdictions*. To its credit, the FNN Concept's layered approach reflects this diversity, with varying combinations of layers reflecting varying public and commercial network assets in geographic areas.

As the FNN Concept envisions, network implementation that leverages multiple wireless networks, systems, and assets provides the most efficient and cost-effective path for FirstNet given the nation's geographic, topographic, and population variability and budgetary constraints. By contrast, a network deployment framework that relies on a single nationwide wireless operator – or which superimposes a monolithic standalone network model across the nation – would fail to reflect the significant variability in service needs, coverage requirements, and levels of local infrastructure availability across the nation.

Additionally, the FNN Concept's view of "network evolution" – creating a flexible framework that allows the nationwide network to grow organically by leveraging the unique resources of each distinct geographic area or political jurisdiction (whether counties, states, or multi-state regions) -- would be undermined by the top-down approach of either building out a standalone network or working with a single nationwide wireless operator. As the FNN Concept

notes, FirstNet must "manage the overall network operations and *define ongoing evolution of the nationwide network to continuously meet or exceed the needs of users and stakeholders.*"[5] As described above, a procurement and deployment model that embraces competition, relying on different combinations of commercial and public network assets that reflect the particular region's coverage and user requirements, can ensure that these needs are met cost-effectively, in a timely manner, and, as the FNN Concept recognizes, *as they evolve over time.*

C. Sprint Nextel's Network Vision Platform Models Alternative Public/Private Partnership Opportunities for the Nationwide Public Safety Broadband Network.

Leveraging the significant investments and combined efforts of the public sector and commercial wireless industry provides the most effective way to expeditiously marry the twin goals of meeting the specific local needs of first responders and building the nationwide network in a cost-effective and timely manner. Depending on the geographic area, this could include a combination of commercial wireless broadband networks, state and local wireless networks, rural telecommunications networks, utility and CII networks, and satellite services.

Sprint's Network Vision platform offers an example of the alternative ways in which commercial infrastructure can be effectively leveraged. Network Vision provides access to an integrated multi-band and multi-protocol wireless architecture designed to support multimode devices (in other words, devices that can dynamically operate on a variety of different bands, with each band capable of supporting different 3G and 4G air interfaces), providing exceptional flexibility as coverage and capacity requirements evolve.

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[5] F. Craig Farrill, "First Responders Network Authority Presentation to the Board: FirstNet Nationwide Network (FNN) Proposal," First Responder Network Authority Board of Directors Meeting, at 6 (Sept. 25, 2012) (emphasis added).

Through network consolidation, Network Vision replaces existing tower hardware designed to work on specific networks with integrated, multimodal equipment, providing significant cost savings in hardware design, maintenance, and cell-site upkeep. Married to network consolidation is a process of spectrum integration, optimizing capacity and coverage by allowing each multimodal base station to leverage the strengths of different frequencies bands. Spectrum integration allows for RAN deployment in multiple spectrum bands using highly flexible, software-defined Base Band Units (BBUs) and Remote Radio Units (RRUs). At its core, Network Vision focuses on technology enhancement, shifting to Internet Protocol (IP) using software-based systems, upgrading technology for stronger signals and wider reach, lessening the environmental impact by using less space and lower power consumption, and supporting next-generation devices that can seamlessly access multiple networks supporting multiple services.

Through flexible platforms like Network Vision, a variety of sharing models exist that can help advance FirstNet's goals of leveraging existing commercial and public assets (tailored to fit particular geographic needs and requirements), containing costs, and providing accelerated deployment of interoperable broadband communications services to the nation's first responders. These include passive site sharing (in which FirstNet would share only physical infrastructure of commercial carriers, such as antenna systems, masts, sites, cabinets, feeder and backhaul, without sharing active elements); traditional roaming (allowing FirstNet subscribers to roam onto commercial networks, either to satisfy capacity requirements or to provide coverage in areas where the NPSBN is not yet operational); and network sharing (in which FirstNet and commercial carriers share some or all of their core or RAN elements – with or without associated spectrum sharing). Network sharing can be implemented in several forms, including Multi-

Operator Radio Access Network (MORAN) sharing, Mobile Virtual Network Operator (MVNO) Virtual Core Service Options, and Multiple-Operator Core Networks (MOCNs). Some of these network sharing options are depicted in Figure 1.

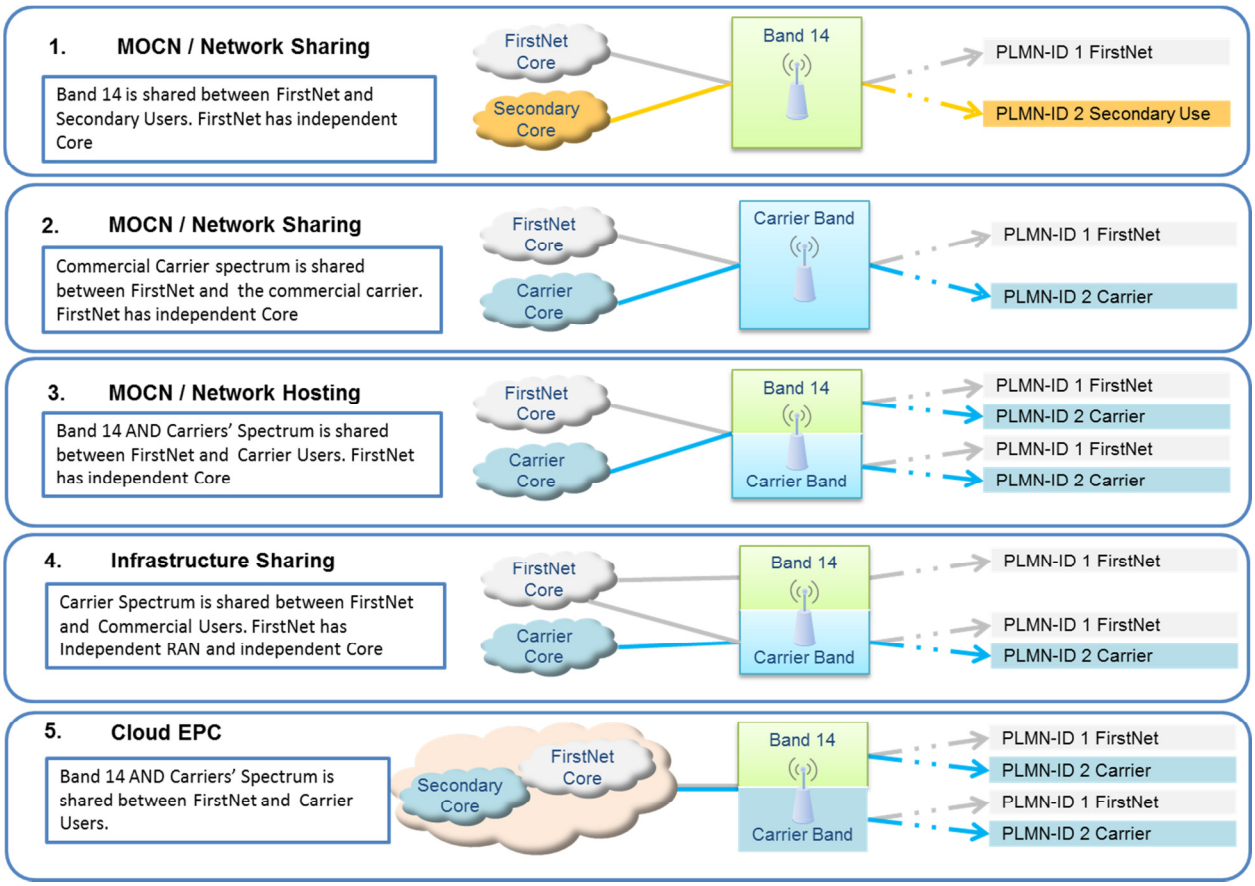

Figure 1 – Network Sharing Configurations

Shared use of spectrum provides the basis for some of the network sharing schemes (MOCN) depicted in Figure 1. Under these sharing schemes spectrum can be deployed on a dedicated or shared basis. Shared spectrum usage can be accomplished in a variety of ways. For instance, spectrum could be "fully pooled," allowing complete sharing of all spectrum and spectrum capacity between partners. Alternatively, spectrum could be "fully split," with each partner maintaining its own spectrum and spectrum capacity. Lastly, spectrum could be shared under "partial reservation," in which each partner reserves a specific portion of its own spectrum

capacity while directing another portion to be fully pooled between partners. LTE also provides for the ability of traffic to be prioritized under established ground rules, which can ensure that a shared NPSBN and commercial network meets public safety priority access requirements.

An entirely separate range of scalable sharing options can be accomplished with respect to the FirstNet core. For instance, Sprint's MVNO Virtual Core Service Option provides additional capabilities and significant cost savings by *virtualizing* the LTE EPC core to support voice, data, and video services using Software Defined Network (SDN) architecture as an optional deployment configuration. Benefits of this approach include a scalable cost structure for even small scale deployments, enabling FirstNet to focus on developing services for its specialized requirements, the ability of FirstNet to control and secure (authenticate) all FirstNet traffic terminated on the EPC through MOCN RAN sharing capabilities on Sprint's LTE network, and allowing FirstNet and other public safety agencies to maintain various security clearance access levels without incremental cost or operating expense overhead. On the other hand, FirstNet could operate its core as a standalone entity that is attached into the shared RAN network. In addition, certain core functionalities could be hosted at a FirstNet EPC while other functionalities are hosted by Sprint or other commercial entities.

Partnership opportunities that leverage commercial expertise and resources extend beyond fixed infrastructure. Even in areas in which existing public wireless networks and resources meet the needs of public safety users, FirstNet can leverage commercial services to supplement those networks – particularly in the wake of high-impact events that might render those networks inoperable or reduce network capacity or coverage. Sprint's Emergency Response Team (ERT) partners with public sector and enterprise clients in need of short-term communications solutions that ensure reliable, scalable, and robust communications in response

to short-term events (including natural disasters and high attendance events in remote areas).[6] By leveraging deployable systems like Sprint's ERT, FirstNet can leverage an affordable and highly mobile commercial solution to expand coverage and capacity for first responders.

As these network sharing options illustrate, FirstNet has a wide array of ways in which it can leverage commercial infrastructure, providing significant cost-savings and accelerating deployment. Through its Network Vision platform, Sprint has implemented – or contracted with prospective partners to begin implementing – all of these various partnership models. In short, combining public safety and commercial investment, infrastructure, and connectivity can be done today using existing commercial models such as Network Vision and offers an optimal approach for establishing the NPSBN.

D. The FNN Concept Promotes Reliability of Public Safety Communications by Emphasizing Network Diversity and Redundancy.

Ubiquitous deployment of a broadband network offers little consolation to first responders in the event of a high-impact event that renders utility and communications networks inoperable or highly congested. Indeed, the NPSBN's success will be measured not merely in the extent of its coverage, but in the depth of the network – specifically, its redundancy and resiliency. As evident from events such as the June 2012 Derecho in the mid-Atlantic region,

[6] Sprint's ERT supports Federal and State Declared Disasters, National Security Events, training exercises, client-driven business continuity incidents, remote operations, and any short-term communications needs. Coordinating personnel, equipment and infrastructure, Sprint's ERT provides turn-key communications solutions on a rapid response basis. ERT personnel, many with extensive military and public safety communications experience, use a system of Satellite Cell on Light Trucks (SatCOLTS) to deploy wireless sites carried on a Ford F650 Super Duty chassis. Once deployed, these mobile base stations are technically and functionally indistinguishable from any other base station transmitter in the Sprint network. Highly mobile and deployable in even the most remote and access-hampered areas, Sprint ERT has deployed over 4,800 times and counting.

high-impact events can highlight network vulnerabilities – including in less visible areas such as data servers.[7]

Conceptualizing FirstNet as a bicycle hub, with many spokes connected to it and a FirstNet network serving to connect the distinct spokes through the use of interoperable protocols and standards, FirstNet will be a 'network of networks.' Through integration of public and commercial wireless networks and further access to commercial networks through roaming agreements, the FNN Concept seeks to ensure that a variety (and depth) of communications networks remain available for first responders. As the FNN Concept observes, "multiple network diversity increases reliability."[8] While the primary path of NPSBN users would be reliance on the NPSBN (itself likely leveraging existing commercial and public sector assets), the secondary path would be to look for complementary terrestrial mobile systems (and failing that, satellite systems, particularly in rural areas, and deployable assets) to provide necessary coverage, capacity, and redundancy. As Board Member Craig Farrill noted, "Reliability multiples by the amount of servers you have."[9]

As the 'bicycle hub,' the most important assets FirstNet brings to bear on the creation of a nationwide network of networks are spectrum and a unified and overarching framework that ensures that disparate network and infrastructure assets are rationalized in a coherent and cost-effective manner. Much of the technical work towards ensuring interoperability has been

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[7] Jason Samenow, "Severe weather and internet outages: vulnerability in the clouds?," *Washington Post* (Aug. 9, 2012), *available at* http://www.washingtonpost.com/blogs/capital-weather-gang/post/severe-weather-and-internet-outages-vulnerability-in-the-clouds/2012/08/09/ecb31c86-e224-11e1-98e7-89d659f9c106_blog.html; Roger Kay, "Power Outage Highlights Infrastructure Vulnerability," Forbes (July 2, 2012), *available at* http://www.forbes.com/sites/rogerkay/2012/07/02/power-outage-highlights-infrastructure-vulnerability/

[8] *Id.* at 11.

[9] *Id.*

accomplished by the Technical Advisory Board for First Responder Interoperability.[10] FirstNet will, however, have to assume an important role in facilitating the administrative, financial, and construction-related facets of interconnecting these varied networks.

III. NETWORK IMPLEMENTATION CAN SUCCESSFULLY MEET ALL FOUR CRITERIA EMPHASIZED IN THE NOI BY RELYING ON MULTIPLE CARRIERS, MAXIMUM FLEXIBILITY, AND DIFFERENT LEVELS OF COMMERCIAL PARTICIPATION DEPENDING ON GEOGRAPHIC NEEDS AND CAPABILITIES.

As discussed above, a competitive network implementation model offers many advantages over the construction of a standalone network or reliance on a single nationwide wireless operator. Of equal importance, this network implementation model can meet all four of the key criteria emphasized in the NOI and discussed in the following sections. Indeed, in many respects a network implementation model embracing flexibility, competition, and responsiveness to local needs and capabilities provides significant advantages over other implementation models in ensuring that the objectives reflected in the four criteria are met.

A. Meeting Public Safety's Requirements for Priority, Quality of Service, and Preemption Features.

At first glance, a standalone network or network relying on a single nationwide wireless operator might offer greater simplicity in organizational and architectural design. As Sprint has emphasized, however, the needs of state and local users will drive these very requirements – and will likely vary across regions and jurisdictions. Furthermore, a network architecture and

[10] "Recommended Minimum Technical Requirements to Ensure Nationwide Interoperability for the Nationwide Public Safety Broadband Network," Technical Advisory Board for First Responder Interoperability (May 22, 2012).

deployment model that embraces competition between commercial providers maximizes flexibility, cost efficiency, and redundancy, and recognizes the role of multiple providers in meeting the varying local and regional needs and capabilities of public safety – both in the near-term and over the long-run. Indeed, in the integration of existing public safety systems with the NPSBN, local priority and preemption requirements can be stipulated in applicable Service Level Agreements that reflect local service, coverage, and capacity requirements.

Additionally, leveraging commercial infrastructure (including networks) poses no obstacle to implementation of prioritization and quality of service needs for public safety communications. Indeed, the LTE networks commercial carriers have begun to deploy revolve around packet prioritization, with network management 'baked-in' to the all-IP network architecture through different prioritization levels for packets. LTE networks offer tremendous advantages over prior network technologies in dynamic network management capabilities, allowing public safety to maintain control over its traffic, its users, and its chosen method of prioritization through a variety of modular technical parameters related to Quality of Service. These include Guaranteed Bit Rate (GBR) and maximum Bit Rate (MBR) value, Allocation and Retention Priority (ARP) and Quality of Service Class Identifiers (QCIs) – all programmable and highly adjustable at the e-NodeB (the sophisticated base stations in an LTE network which move the network 'intelligence' closer to the end-user).

B. Using Existing RAN and Core Network Infrastructure Installed by Commercial Mobile Operators to the Maximum Extent Possible.

By its very nature, a network architecture and deployment framework that relies on multiple wireless networks and systems will use existing commercial RAN and core network infrastructure to a far greater extent than will a standalone network -- or even a deployment

relying on a single nationwide wireless carrier. With a competitive procurement model, multiple commercial wireless networks and systems will provide coverage, capacity, and redundancy to the greatest possible geographic area while minimizing capital expenditures.

As emphasized above, reliance on multiple commercial wireless providers and a regional network implementation approach best serves FirstNet's goal of pursuing a cost-effective deployment with maximal network coverage. No carrier has ubiquitous nationwide coverage, making reliance on a single nationwide wireless carrier an unappealing approach if maximizing coverage (particularly in rural and remote areas) is a significant goal for FirstNet. Further, carriers will likely have varying interest in network hosting in different regions, depending on their current network demands and the extent of their network assets in those regions. Additionally, the layered approach reflects recognition that commercial carriers can also provide important roaming opportunities for public safety to maximize coverage and capacity in a cost-effective way.

C. Reaching Operational Capability As Quickly As Possible.

Throughout these comments Sprint has described the ways in which reliance on multiple commercial wireless networks can accelerate deployment of the NPSBN. Beyond ensuring that operational capability is reached rapidly, an optimal deployment approach must ensure that the network can respond to evolving operational needs and new technological capabilities – guaranteeing that public safety users aren't "locked-in" to antiquated technologies or systems. The same operational flexibility that Network Vision provides Sprint can be extended to public safety, including reduced costs, improved performance and coverage, optimized use of spectrum assets and technological flexibility. Specifically, the multi-modal network platform enables

multiple technologies and spectrum to be deployed on a common platform, allowing public safety to seamlessly deploy services on different frequencies as their operational needs require.

Competition represents an integral component of this implementation model, encouraging providers to vie for partnership opportunities in each region. A network deployment framework that emphasizes competition between multiple carriers and other NPSBN suppliers helps ensure that public safety finds private partners that share their public partners' long-term vision and can work collaboratively with them to meet unforeseen needs and capabilities.

D. Enables Voice Services (Including Cellular Telephony and Push-to-Talk) Both Within the FirstNet Network and as to and from Other Commercial Networks, Including the Public Switched Telephone Network.

Sprint has a unique perspective on the integration of cellular telephony, push-to-talk (PTT), and broadband services. With a strong history of integrating traditional voice and PTT services, Sprint sought to replicate its vaunted iDEN PTT service on a broadband platform. After seven years of development – including millions of dollars in technology research and extensive testing – Sprint's Direct Connect platform provides voice, broadband, PTT, and future Push-to-X capabilities to users. Additionally, Sprint offers custom solutions that enable integration of our PTT services directly into Public Safety dispatch systems, creating a truly integrated, system-of-systems framework. Sprint does not expect public safety users to replace their existing mission critical public safety LMR networks with voice on the NPSBN for many years.[11] The key for FirstNet, however, is to adopt a flexible network architecture that can successfully integrate these systems over time. The FNN concept contemplates just this sort of

[11] Commercial operators generally will retain their circuit switched voice services for some time in the future, as well.

diverse network architecture, with public networks and commercial networks leveraged to their maximum ability.

IV. CHAIRMAN GINN'S CONCEPTUAL DISCUSSION SIMILARLY PROVIDES AN IMPORTANT FIRST STEP IN THE DEVELOPMENT OF APPLICATIONS FOR PUBLIC SAFETY USE.

Like the conceptual presentation on network architecture and deployment, Chairman Ginn's conceptual discussion on the development of applications for public safety use provides a solid foundation for consultation with states and localities and subsequent development work directed by FirstNet. Sprint considers many of the same principles informing development of the network architecture and deployment framework to be equally applicable to the development of an applications ecosystem: namely, identifying the service needs and capabilities of state and local public safety users, fostering competition, providing a coherent and unified framework for development work, and leveraging commercial assets and expertise.

A. As In the Case of the Commercial Sector, An Applications Ecosystem Cannot Develop Overnight.

Chairman Ginn's focus on developing a robust applications ecosystem for public safety exemplifies the vision FirstNet must continue to foster in order to successfully develop a nationwide public safety broadband network. The applications Chairman Ginn envisions depend on robust broadband access, permitting public safety users to utilize a wealth of content-rich, dynamic, and responsive capabilities heretofore unavailable on most public safety communications platforms. These exciting capabilities will not, however, develop overnight. As the Board's conceptual discussion indicated, test beds will have to be created in which

innovators, network operators, and end users can interact and collaborate in the development of applications that suit the needs of public safety users.

In particular, NIST's work in collaboration with the Department of Homeland Security could provide an important foundation for subsequent research and development. Notably, Congress identified a number of ways in which NIST could help direct applications development, including creating "a list of certified devices and components meeting appropriate protocols and standards for public safety entities and commercial vendors to adhere to"[12] and targeted R&D under the NIST Directed Research and Development Program (which specifically contemplates development of "applications to advance wireless public safety communications").[13]

Though support from NIST and direction from FirstNet will help, given the unique security and certification requirements of public safety applications, development will likely require lengthier time-to-market and will include less independent development by so-called 'garage innovators' than has occurred in the commercial sector. Indeed, in some cases, developers might need to pass background checks or certification requirements to ensure that applications used by public safety and accessing the NPSBN do not pose a threat to the network or to national security. While these constraints will likely limit the scope of the public safety applications ecosystem, it should by no means stymie its development. With proper oversight, direction, and financial incentives, FirstNet and associated agencies can encourage a flourishing applications market for public safety users.

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12 *Id.* at §6206(c)(6).

13 *Id.* at §6303(a).

B. As With Development of the Network Itself, the Development of Public Safety Applications Must Reflect the Unique and Variable Needs of Public Safety Users.

In all aspects of the NPSBN development, the needs of federal, state, and local users must be reflected in the ultimate implementation actions of FirstNet. This is also true as to fostering an applications ecosystem. As Sprint described in comments concerning the State and Local Implementation Grant Program, different public safety users will likely consider different services essential to the public safety communications in their jurisdiction. For instance, while some public safety users might identify real-time incident video monitoring an essential capability in their day-to-day activities, others might well consider rapid fingerprint or photo analysis a higher priority.

FirstNet should solicit the views of different public safety organizations regarding applications they consider of the highest priority. The State and Local Implementation Grant Program offers an ideal opportunity for FirstNet to gather important information from public safety users, gaining a greater understanding of the services they expect the NPSBN to support. From these consultations, FirstNet can formulate lists of functional capabilities considered high priority by public safety users, creating a possible development hierarchy among them. More importantly, by finding commonalities across different jurisdictions, FirstNet can most effectively marshal resources and avoid duplicative work in the development of applications that meet common needs.

C. As the FNN Concept Recognized, Different Public Safety Users Will Likely Utilize Different Types of Devices. FirstNet Should Consider the Ways in Which Too Much Platform Diversity Can Undermine An Applications Ecosystem.

Competition represents an integral part of the procurement process for the NPSBN, not only in network infrastructure and services but also in devices and applications. At the same time, greater variety among device platforms poses the risk of balkanizing the applications ecosystem – and potentially undermining interoperability of services in an unexpected way. Specifically, applications developers frequently focus on programming for only a single – or perhaps small combination (2-3) of – operating systems.

Today, public safety users rely on a multitude of different device platforms – including LMR, Blackberry, Apple iOS, Android, Windows Phone, and others. Programming a public safety application that operates on all of these platforms would likely be uneconomical for most developers. If certain public safety users depend on applications supported by a single platform, they may find it difficult to adapt to a new application should they require a different device (for instance, a more ruggedized device to respond to an emergency, or a device provisioned by a local jurisdiction in which they are assisting).

Realizing the same economies of scale as commercial carriers remains a key objective for FirstNet. In light of the economic realities of applications development, FirstNet should consider concentrating applications development resources on only the most widespread, supportive, and viable applications platforms. This could contain costs, promote interoperability of services, and help public safety entities enjoy the economies of scale of commercial entities. To be sure, however, this should not drive FirstNet towards adoption or endorsement of a single device platform. Competition between device manufacturers remains an essential component of the NPSBN's success. Sprint looks forward to working with innovators, end users, NIST, DHS, and FirstNet in the development of secure and dependable applications to support public safety.

V. CONCLUSION

FirstNet has set in motion the development of the Nationwide Public Safety Broadband Network, offering a vision of the way in which FirstNet anticipates effectuating the responsibilities entrusted to it in the Middle Class Tax Relief and Job Creation Act of 2012. In both the conceptual presentation on network architecture and development, and the conceptual discussion on applications development, FirstNet has embraced the Congressional directive to leverage existing commercial and public sector assets to the maximum extent economically desirable. By emphasizing competition, engaging states and localities in close consultation to identify their needs and capabilities, and developing a regional model that identifies commonalities between states and local jurisdictions, FirstNet can contain costs, maximize coverage, and deliver to public safety the innovation, economies of scale, and broadband capabilities that commercial carriers enjoy.

Respectfully submitted,

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